

After this first attempt we tried the trawl several times at depths of 1,090, 1,525, and finally 2,125 fathoms, and always with success.

Several fishes, most of them allied to *Macrourus*, were added to the list. Several decomposed crustaceans, and among the lower crustaceans at 1,090 fathoms, a gigantic amphipod, of the family Hyperina, allied to *Phronima*. The eyes of this creature are very remarkable, extending in two great facetted lobes over the whole of the anterior part of the cephalo thorax, like the eyes of *Aeglina* among Trilobites. This crustacean, which is three and a half inches in length, makes a splendid drawing, and reminds one of the old Eurypterids, is in process of description at the hands of Dr. von Willemoes Suhm.

Mollusca are very scarce in deep water, and our catches have hitherto been chiefly confined to such things as the species of *Nucula*, *Leaa*, *Verticordia*, &c., familiar through the deep dredgings of the *Porcupine*. Among the molluscoids a haul in 1,525 fathoms gave us a lovely thing, a bryozoan forming, out of branches closely resembling those of *Accromarchis neritina*, a graceful cup, the bases of the branches united by a transparent stem between two and three inches high, like the barrel of a quill, or the stem of a claret glass. This genus, which presents a general character totally different from anything hitherto known among recent Bryozoa, I mean to dedicate to Captain Nares, as an early recognition of the confidence and esteem which he has already fully gained from the scientific staff. *Naresia cyathus* certainly recalls, in a most singular way, the Cambrian *Dictyonema*, a form which I had, however, hitherto been inclined to refer to the Hydrozoa.

The Echinoderms have yielded some exceedingly interesting species to the trawl; among them several examples of the beautiful little urchins, of which one specimen was taken by Count Pourtales, in the Straits of Florida, and described by Alexander Agassiz under the name of *Salenia varispina*. It is undoubtedly a true *Salenia*, and to an advocate of the doctrine of the "continuity of the chalk," it is pleasant to see in the flesh this little beauty, which has hitherto been reckoned among the lost tribes.

Among the star-fishes two species of the genus *Hymenaster* have occurred, and the ophiurids are well represented chiefly by large examples of several species of the genus *Ophiomusium*.

All the hauls of the trawl, down to 2,125 fathoms, have yielded many specimens of a singular Holothurid, of which a description will shortly be published by Mr. Moseley. The animal is of a rich violet colour. Like *Psolus*, it has a distinct ambulating surface, with a central double line of water-feet. The body cavity is small, but the perisom is represented by an enormously thick layer of jelly, which rises on either side of the middle line of the back into a series of rounded lobes, each perforated for the passage of an ambulacral tube and corresponding therefore with an ambulacral foot. The upper pair of vessels of the trivium send out series of leaf-like sacs, richly loaded with pigment, which fringe on either side the ambulatory disc, and appear to be chiefly concerned in the function of respiration.

Sea-peas and Gorgoniæ have occurred frequently, always remarkable for their brilliant phosphorescence. Captain Maclear is giving special attention to this beautiful phenomenon. A *Mopsea*, which shone very brilliantly, gave a spectrum extending from the green well on into the red, while *Umbellularia* gave a very restricted spectrum sharply included between the lines *b* and *D* of this wonderfully rare sea-pea. We took with the trawl a very fine specimen, with a stem 3 ft. long, at a depth of 2,115 fathoms off Cape St. Vincent.

As usual in deep-sea work sponges preponderated, and the order has added several novelties, chiefly referable to the ventriculite group, the Hexactinellidæ.

Some fine new species of *Aphrocallistes* came up along the coast of Portugal, and off St. Vincent; with many spicules and more or less mutilated examples of *Hyalonema*, two or three species in fair condition of a species of *Euplectella*, with spicules which I cannot distinguish from those of *Euphalelles aspergillum*—the Venus flower-basket of the Philippines. The form of the two sponges is the same, but our own specimens are quite soft, the spicules not fused into a continuous siliceous network.

The physical and chemical observations will be fully detailed hereafter. The temperatures off the Coast of Portugal corresponded very closely with those taken in the *Porcupine* in 1870, and the *Shearwater* in 1871, below the first 100 fathoms through which at this season the temperature is nearly uniform. WYVILLE THOMSON

PROF. FLOWER'S HUNTERIAN LECTURES

LECTURES X. XI. XII.

THE fossil *Dasyopodida*, or their existing allies, are found in America only. They may be divided into two classes, those closely resembling existing species, and those differing considerably from them. Most of the former have only been obtained in a fragmentary state; they have been studied by Lund; one was peculiar in having the teeth compressed from before backwards, instead of laterally. The latter class includes a well-known form, *Glyptodon*, of which there are several species, and perhaps more than one genus. An exhaustive monograph is in course of publication by Burmeister on the genus, and the material he has at his command at Buenos Ayres is very large. In 1839 Prof. Owen was among the first to describe it, he did so from the specimen now in the Museum of the College, giving it the name by which we know it. The Danish naturalist, Dr. Lund, at about the same time gave the name *Hoplophorus* to the remains of a very similar animal, and Burmeister considers that there is sufficient difference between the two type specimens of these authors, that of the latter having one less hind toe, to justify the generic name proposed by each being retained. In *Glyptodon* the carapace is proportionately thicker and stronger than in existing Armadillos; it is composed of distinct pieces in contact at their edges, but not ankylosed, except in aged individuals; it is never hinged transversely, so the animal could not roll itself up. A horny epidermis undoubtedly covered the shield, and hairs may have been present, as foramina are frequently found. The scutes vary in shape in different species, and are of different sizes in different parts of the same individual. The tail formed a thick cylindrical scute-covered column, which in some cases was armed with spines and swollen near the tips, like a giant's club. An approach to this peculiar shape is seen in the existing *Chlamydo-phorus*. All known species have eight molars above, and the same number below on each side of each jaw, in a long straight, nearly parallel series, running very far back. The teeth all grew from persistent pulps, and were therefore long and slightly arched, with two deep flutings on each side, whence the name. In structure they were much as in the Armadillos, and the presence of the grooves caused the central harder osteodentine to assume a somewhat gridiron shape, which was sometimes much elaborated. The front of the skull was much truncated, and a strong ossified septum was often present. Burmeister thinks that the animal possessed a trunk. The brain was proportionately very small, the olfactory lobes and cerebellum preponderating. Much of the skull was occupied by air cells and the molar roots. The descending zygomatic process was very large, to give origin to the masseter muscle; it is absent or nearly so in the Armadillos; it may differ in character from that of the Megatherium, probably arising from the maxillaries, as it was

perforated at its base by the infraorbital foramen. The vertebral column was most peculiar. Of the seven cervical vertebrae the first and sixth only were free, then came the "trivertebral bone" of Prof. Huxley, formed of the last cervical and first two dorsals; this was hinged ginglymoidly by the transverse processes on the next mass, which was composed of the rest of the dorsal vertebrae. The lumbar vertebrae were ankylosed together, but not to the last (the 13th) dorsal. The centra of the vertebrae were only represented by a thin bony plate which helped to form the tube for the spinal cord. Prof. Huxley thinks that the joint in the dorsal region was connected with the respiratory process, Burmeister considers that it enabled the animal to retract its head. The pelvis was much as in the Armadillo; the ilia were perpendicular. The symphysis pubis was slender, and is but infrequently preserved. The scapula possessed the characteristics of the class; the humerus had a supra-condyloid foramen, and the radius and ulna were not ankylosed. The ungual phalanges were all hoof-like. As in the armadillos and seals, the 4th metacarpal bone articulated with the cuneiform as well as with the unciform, and the 5th with the latter only; the pollex was absent. There was no third trochanter to the femur; the astragalus was normal; and there were four or five toes to the hind foot.

Of the other extinct Edentata there are none closely allied to the Ant-eaters, Ant-bears, or Pangolins. In the Upper Miocene of Darmstadt an ungual phalanx has been found, which like those of *Manis* is longitudinally split; it has been named *Macrotherium* by Lartet. Teeth have been found since, much like those of *Dasypus*, so it could not have been a *Manis*. At Pikermes similar remains have been found, which have been named as parts of *Ancylotherium*. These animals must form a separate division of the Edentata.

The *Ungulata* are the next great group to be considered. In their teeth they all tend to the typical formula

$$i. \frac{3}{3} c. \frac{1}{1} p. m. \frac{4}{4} m. \frac{3}{3} = 44. \text{ The milk teeth are always}$$

functional and generally remain until the animal is nearly fully grown. The limbs are formed for simple support and progression, and there is no trace of clavicles. Except in the camels, the hoof encloses the ungual phalanx. Leaving Hyrax out of consideration it may be stated that the pollex and hallux are always absent. The class is found in all the world but the Australian region; they have not been found fossil in strata below the tertiaries, but in the oldest of them. They are absolutely divisible into two sub-classes from characters indicated by, but not entirely dependent on the structure of the feet. This division was indicated by Cuvier, but developed by Owen and H. N. Turner, Jun. Owen introduced the terms Perissodactylata and Artiodactylata by which these sub-classes are best known. In the *Perissodactylata* the middle toe is symmetrical, and there is typically one toe on each side of that, except in the Tapir and an early fossil Rhinoceros, *Acerotherium*. The astragalus has a single large anterior facet, entirely or mainly for articulation with the navicular. There is a third trochanter to the femur, and there are never less than twenty dorso-lumbar vertebrae. The nasal bones expand posteriorly, and there is an osseous alisphenoid canal, as pointed out by Mr. Turner. In the *Artiodactylata* the axis of each of the feet is between the middle and fourth toe, and there is one toe outside each of these, but in the Peccary one is absent in the hind foot. The astragalus supports both the navicular and cuboid bones on nearly equal-sized facets. There is no third trochanter to the femur, and there are always nineteen dorso-lumbar vertebrae. There is no alisphenoid canal; the palate is completed by bone opposite the posterior molars. All these characters, especially when taken in connection with the teeth, make it easy, from a few fragments of the skeleton, to identify the

sub-class to which fossil members of the class belong. In the Perissodactylata the persistent premolars and the molars are very much alike, being all double, but in the Artiodactylata the premolars are single, and therefore they do not form a uniform series with the molars; there is a third lobe to the last lower molar, except in an antelope, *Neotragus Saltiana*, as lately proved by Sir V. Brooke.

The earliest of the Perissodactylata are the *Lophiodontidae*, from the lower Eocene. They are rather more generalised than the existing forms, as would be expected on the evolution hypothesis. The premolars are simpler than those behind. *Coryphodon*, the oldest, is known by its teeth, of which it possessed the typical forty-four, and a femur with a third trochanter. Its molars had two ridges with conical apices, whence Owen gave it its name, from a specimen dredged off Harwich. The feet are not known unfortunately.

Lophiodon itself is only known by its teeth and fragments of the skeleton; the upper part of the skull has not yet been found. It is a genus of the early and middle

Eocene only. Its dental formula was $i. \frac{3}{3} c. \frac{1}{1} p. m. \frac{3}{3} m. \frac{3}{3}$.

The molars are representatives of the type which runs through the whole class. In the upper jaw each tooth presented an outer wall, which developed into two well-formed cusps; running back from this were two transverse ridges, an anterior and a posterior, as they are termed. The anterior transverse ridge springs from in front of the anterior cusp, the posterior from in front of the one behind; these ridges, each by their curving backwards, enclose a space named the anterior and posterior sinuses. The posterior transverse ridge is absent in the premolars. The lower molars are simpler. The premolars were reduced in a manner which characterised the genus, the hinder part being cut away. *Lophiodon* is mainly found in the lacustrine deposits of the south of France; there were several species, varying in size from a full-grown Indian rhinoceros to that of a hare. Leidy, from the deposits of Nebraska, found a tooth exactly resembling those of this genus; he has named it *L. occidentalis*, but acknowledges the insufficiency of the evidence on which it is founded.

The next animals to be considered were about the size of the hare. *Pachynolophus* differed from *Lophiodon* in having seven pre-molars and molars in the upper jaw instead of six; the number in the lower jaw is not quite so certain, some having apparently six and others seven. The ridges of the teeth were less considerable and more broken into tubercles. In the London clay, near Herne Bay, a skull was found, named by Prof. Owen *Hyracotherium*. Mr. H. N. Turner was the first to point out that this animal was one of the Perissodactylata, and not as Prof. Owen at first supposed, allied to the Suidæ. The teeth very closely resembled those of *Pachynolophus*, each transverse ridge developing into a median smaller tubercle and a posterior larger one; the pre-molars were also considerably smaller than those behind. From the resemblance of the teeth it is evident that the French genus *Pachynolophus* and the English *Hyracotherium* must be considered to be one. *Pliolophus* is the name of a genus given by Owen to a specimen obtained from the London clay off Harwich, together with a humerus, femur, and three metatarsals. The forty-four teeth were present. There is no reason to suppose that this genus is different from *Hyracotherium*, the shape of the teeth and the size being identical; Prof. Owen himself states the possibility of their identity. The fact of there having been three metatarsals or metacarpals as they may be, found together, is a collateral one in favour of the animal having been Perissodactylate. From the above remarks it is evident that the names *Pachynolophus* and *Pliolophus* must be sunk in favour of *Hyracotherium*, as must also *Lophiotherium*, a name given by Gervais to an Upper Eocene specimen, known only by the mandible.

At the same time lived another small animal, *Miolophus*, known only from a fragment now at York. It differs from most ungulates in having only a single inner cusp to the molars, so causing it to resemble a typical pre-molar. Another form, *Microchaerus erinaceus*, is very aberrant, and its position is doubtful.

TESTIMONIAL TO DR. BENCE JONES

WE regret very much to hear that Dr. Bence Jones has been compelled on account of his health to resign the office of Secretary to the Royal Institution, a post which he has filled for so many years with equal honour to himself and advantage to the Institution.

His conviction of the value of original research, and of the special vocation of the Royal Institution to continue diligent in promoting it, was with him an unceasing stimulus to exertion. His attention to every detail left nothing neglected in the performance of his duties. His own scientific attainments have been of signal effect in maintaining respect for the Institution, and in procuring the co-operation of eminent men in the laboratories and lecture theatre. His love of the place and its memories has been shown by the pains he took to collect its early annals; including in this work an account of the discoveries of Young and Davy, and by his becoming the historian of Faraday.

The services of Dr. Bence Jones have been given under the pressure of important professional engagements, and latterly under the additional difficulties of failing health; and until now, when he has been reluctantly compelled to resign, he has never relaxed in the active prosecution of his honourable task.

We trust with the managers, however, that the aid of Dr. Bence Jones may not be altogether lost to the Institution; but that he will still afford to it the benefit of his counsels and experience. It is hoped that he may in future occupy a seat at the Board of Management; and further, that he will remain associated with the Institution by doing it the favour of accepting the position of Honorary Assistant-Secretary.

It has very naturally been proposed to present Dr. Bence Jones with a testimonial to be raised by subscription, and we feel confident that to so worthy a purpose there will be no lack of willing contributors. Individual subscriptions are limited to 3*l.* 3*s.* as a maximum.

It has been ascertained that the form of testimonial most agreeable to Dr. Bence Jones would be a bust of himself to be placed in the Royal Institution. Subscriptions to this testimonial may be paid either at the Royal Institution, or to "The Dr. Bence Jones Testimonial Account," at Messrs. Drummonds, the bankers, Charing Cross, who are authorised to receive the same.

CAPTAIN M. F. MAURY

MATTHEW FONTAINE MAURY, whose death, on Feb. 1, we recently recorded, was of French descent, and was born in Spotsylvania County, Virginia, Jan. 24, 1806. While still a child, his parents, who were in moderate circumstances, removed to Tennessee, where young Maury was sent to school. In 1825, when nineteen years old, he entered the service of the United States as midshipman, circumnavigating the globe in the *Vincennes*, during a cruise of four years. During this cruise Maury began his well-known "Treatise on Navigation," which was finished some years afterwards, and was for a long time used as a text-book in the U.S. navy. In 1836 he was made lieutenant and was gazetted astronomer to an exploring expedition.

In 1839, while travelling on professional duty, Lieut. Maury met with an accident which resulted in permanent

lameness and unfitted him for active service afloat. What appeared then as a great misfortune to the lieutenant resulted indirectly in an increase of his fame, and in the performance of services of high value to science and humanity. The lame lieutenant was placed in charge of the Dépôt of Charts and Instruments, out of which have grown the Naval Observatory and the Hydrographic Office of the United States. He laboured assiduously from the first day of his appointment to organise this dépôt more efficiently than formerly. How completely he succeeded is well known.

While sailing around the globe in the *Vincennes*, Maury made many observations as to the winds and currents. These he continued in his subsequent cruises. When he became superintendent of the Hydrographic Office he determined to do something towards elucidating the intricate subject of ocean meteorology. The beginnings of this great undertaking were small. Maury obtained at first copies of such log-books as he or his friends could command. He noted the direction of the wind, the currents, &c., on the maps which he had prepared. As the information came in, districts were filled up and places pointed out for investigation. In 1842 the system had taken such consistency in his own mind that the lieutenant communicated to the U.S. Naval Bureau of Ordnance and Hydrography a plan for supplying model log-books to the commanders of vessels in the naval and merchant marine service. These log-books are so arranged that a systematic series of observations might be registered. The plan succeeded so well that in eight or nine years he had thus collected a sufficient number of logs to make 200 manuscript volumes averaging each about 2,500 days' observations each. These materials were digested by a board of officers appointed for that purpose, and the more immediate result of their labours was to show the necessity for combined action on the part of the maritime nations in regard to ocean meteorology.

In order that his labours might lead to some practical result, Maury wrought zealously to bring about a meeting of meteorologists belonging to all maritime nations; this led to the conference which met at Brussels in 1853, at which England, France, Russia, Portugal, Belgium, Holland, Denmark, Norway and Sweden were represented, and which produced the greatest benefit to navigation, as well as indirectly to meteorology. One of its most eminent and practical results was the establishment in London of the Meteorological Department of the Board of Trade. It recommended a model log-book for all vessels, in which a brief and uniform register of the principal meteorological phenomena are entered. The British Admiralty, the Royal Society, and the British Association entered heartily into Maury's plans, and aided him in every possible way; though we are ashamed to say that England is almost the only civilised country in the world that did not confer on this great benefactor of humanity some mark of honour: other countries loaded him with well-deserved tributes of admiration and gratitude for his services.

At the outbreak of the American civil war in 1861 Maury threw in his lot with the South, and did much to strengthen its maritime defences and enable it to hold out for so long as it did. He afterwards retired to England, where he lived for many years, and where he was presented with a handsome testimonial raised by subscription, he having lost nearly his all through his attachment to the unfortunate South. Having offered his services to the ill-fated Maximilian, of Mexico, the latter appointed him Imperial Commissioner of Emigration; and after the fall of that short-lived empire, Maury returned to the United States, taking up his residence in Virginia, where he lived until his death, on February 1 last. During his later years he devoted his time and efforts to urging his fellow-citizens of the South to leave politics alone and